3.3 some additional rules/shortcuts for finding derivative functions

what we know:

$$\frac{d}{dx}(c) = 0$$

$$\frac{d}{dx}(c\,f(x)) = c\,\frac{d}{dx}(f(x))$$

$$\frac{d}{dx}(f(x) \pm g(x)) = \frac{d}{dx}(f(x)) \pm \frac{d}{dx}(g(x))$$

Power Rule $\frac{d}{dx}(x^n) = n x^{n-1}$ [[the "x" has to be in the base]]

Product Rule

$$(fg)' = f'g + fg'$$

$$\frac{d}{dx}\left(x^6\right) = \frac{d}{dx}\left((x^2)(x^4)\right) = (2x)(x^4) + (x^2)(4x^3)$$

$$= 2x^5 + 4x^5 = 6x^5$$

$$= 6x^5$$

$$\frac{d}{dx}\left((x^3)(x^3)\right) = (3x^2)(x^3) + (x^3)(3x^2)$$

Oct 1-7:26 AM

$\frac{d}{dx}\left((x^2+1)(7x^4-3x^3+2x)\right)=$ (f, g) $\quad (fg)' = f'g + fg'$

$= (2x)(7x^4-3x^3+2x) + (x^2+1)(28x^3-9x^2+2)$

$(\sin x)' = \cos x$

$\frac{d}{dx}\left((x^3)(\sin(x))\right) =$

$(3x^2)\sin x + (x^3)\cos x$

$x^2\left(\frac{3x^2\sin x}{x^2} + \frac{x^3\cos x}{x^2}\right) = x^2(3\sin x + x\cos x)$

Quotient Rule

$$\left(\frac{f}{g}\right)' = \frac{f'g - fg'}{g^2}$$

$$\left(x^3\right)' = \left(\frac{x^5}{x^2}\right)' \overset{QR}{=} \frac{(5x^4)(x^2) - (x^5)(2x)}{(x^2)^2}$$

$$= \frac{5x^6 - 2x^6}{x^4} = \frac{3x^6}{x^4} = 3x^2$$

$$3x^2$$

Oct 1-7:26 AM

$$\frac{d}{dx}\left(\frac{x^3}{\sin x}\right) = \frac{(3x^2)(\sin x) - (x^3)(\cos x)}{\sin^2 x}$$

$\sin^2 x$ = stupid shortcut for $(\sin x)^2$

$$\frac{d}{dx}\left(\frac{\sin x}{x^3}\right) = \frac{(\cos x)(x^3) - (\sin x)(3x^2)}{(x^3)^2}$$

Oct 1-7:26 AM

Product Rule

$$(fg)' = f'g + fg'$$

Quotient Rule

$$\left(\frac{f}{g}\right)' = \frac{f'g - fg'}{(g)^2}$$

Oct 1-8:03 AM

27) $\left(\frac{3x+2}{x}\right)\left(x^{-5}+1\right)$

$= \left(3+2x^{-1}\right)\left(x^{-5}+1\right)$

$= 3x^{-5}+3+2x^{-6}+2x^{-1}$

Oct 1-8:07 AM

3.4 Derivatives of Trig Fns

p 380

$\frac{d}{dx}(\sin x) = \cos x$

$\frac{d}{dx}(\cos x) = -\sin x$

$\frac{d}{dx}\left(\frac{\sin x}{\cos x}\right) - \frac{d}{dx}(\tan x) = \sec^2 x$

$\frac{d}{dx}(\cot x) = -\csc^2 x$

$\frac{d}{dx}\left(\frac{\cos x}{\sin x}\right)$

$\frac{d}{dx}\left(\frac{1}{\cos x}\right) = \frac{d}{dx}(\sec x) = \sec x \tan x$

$\frac{d}{dx}(\csc x) = -\csc x \cot x$

$\frac{d}{dx}\left(\frac{1}{\sin x}\right)$

Oct 1-8:13 AM